



# A STUDY OF CORRELATION AMONG SLEEP APNEA, ANTROPOMETRIC PARAMETERS AND SYSTEMIC BLOOD PRESSURE

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## ABSTRACT

**AIMS:** To study the correlation among sleep apnea, anthropometric parameters and systemic blood pressure.

**OBJECTIVES:** To find the difference in BMI, Waist Circumference, Neck Circumference, Waist -Hip ratio, SBP and DBP among participants of AHI>10 group and AHI≤10 group.

**METHOD:** Two groups were studied, AHI>10 having 22 participants and AHI≤10 having 19 participants on bases of severity of sleep apnea recorded by polysomnography. Their height was measured with help of mounted measuring tape, weight was recorded using weighing machine, neck circumference, waist circumference, hip circumference were measured with metallic measuring tape followed by calculation of waist to hip ratio and BMI. The comparison of all these parameters was done among the participants of the AHI>10 and AHI≤10 groups.

**RESULT:** Mean BMI of participants in AHI>10 group was more as compare to mean BMI of participants in AHI≤10 group and the difference was highly significant.

Mean SBP of participants in AHI>10 group was more as compare to mean SBP of participants in AHI≤10 group and the difference was highly significant.

Mean DBP of participants in AHI>10 group was more as compare to mean DBP of participants in AHI≤10 group and the difference was highly significant.

**CONCLUSION:** The present study shows that anthropometric parameters as well as systolic and diastolic blood pressure were significantly more in AHI > 10 group as compared to AHI ≤ 10 group.

**KEY WORDS:** Sleep apnea, Systolic blood pressure, Diastolic blood pressure, Waist/hip ratio, Body mass index, Neck circumference, Waist circumference.

## INTRODUCTION

Obstructive Sleep Apnea (OSA) is a common disorder, affecting approximately 4% of adult men and 2% of adult women in general population.<sup>[1]</sup> OSA is characterized by repeated episodes of complete or partial obstruction of the upper airway during sleep.<sup>[1]</sup> Apnea is the complete cessation of airflow lasting at least for 10 second and hypopnea is a discernible fall in airflow lasting for at least 10 second accompanied by a decrease in oxygen saturation of at least 3%.<sup>[2]</sup> Apnea-hypopnea index (AHI) is the total number of apneas and hypopneas per hour of sleep.<sup>[2]</sup>

The gold standard for diagnosis of sleep apnea is polysomnography. It is simultaneous recording of multiple physiologic parameters, namely electroencephalogram, electrooculogram, electromyogram, oronasal airflow, chest wall and abdominal motion, body position, snoring, electrocardiogram and oxyhaemoglobin saturation<sup>[2]</sup>.

In patients with sleep apnea, airway obstruction causes increases in respiratory effort, intermittent arterial oxygen desaturation, and sleep fragmentation,<sup>[1]</sup> sleep fragmentation increases sympathetic activity,<sup>[3]</sup> which can increase systemic and pulmonary arterial blood pressure alterations<sup>[1]</sup>

Obesity is considered as a major risk factor for the development and progression of OSA.<sup>[4,5]</sup> The prevalence of OSA in obese or severely obese patients is nearly twice that of normal-weight adults. Furthermore, patients with mild OSA who gain 10% of their baseline weight are at a sixfold-increased risk of progression of OSA, and an equivalent weight loss can result in a more than 20% improvement in OSA severity.<sup>[6]</sup>

So, in this study attempt is made to find the relation between anthropometric parameters, sleep apnea and their effect on systolic and diastolic blood pressure.

## METHODOLOGY:

This study was carried out in Sleep Research Center, MGM Hospital Kamothe, Navi Mumbai. Age range of participants were from 20 to 70 years. Normal participants, participants having obstructive sleep apnea and free from other diseases were included in this study.

Total sample size was 41 which was divided into two groups, AHI>10 and

AHI≤10 on bases of severity of apnea. In AHI>10 group there were 22 participants, out of which 19 were male and 3 were female. In AHI≤10 group there were 19 participant, out of which 12 were male and 7 were female.

## Methodology of each objective:

### Polysomnography:

- Patients were called at 8 pm in sleep research center.
- Then procedures were explained to them.
- Followed by which their consents were taken.
- After which their height, weight, waist circumference, hip circumference, and neck circumference was taken to find out their body mass index (BMI) and Waist/Hipratio.
- Followed by which electrodes were placed according to their positions for recording polysomnogram
- After which the recordings were recorded from 10 pm to 6 am.

### Anthropometric measurement ::

#### Height and weight:

Height was recorded in cm with help of wall mounted measuring tape and weight was measured in kg with help of weighing machine and BMI was calculated.

**Neck circumference:** The neck measurement was taken immediately above the thyroid cartilage (the Adam's Apple) with help of flexible metal tape measure. The subject was asked to keep their head up and look straight ahead while taking measurement, it was necessary to make sure that tape is not too tight or too loose, and is lying flat on the skin.

**Waist circumference:** waist circumference was taken at the approximate mid-point between the lower margin of the last palpable rib and the top of the iliac crest.

**Hip circumference:** Hip circumference was measured around the widest portion of the buttocks.

**Blood pressure(BP):** In the morning after recording polysomnogram, BP was noted two times With the help of Omron digital sphygmomanometer in sleeping position after rest of 5 minutes, then average of this two readings were taken.

#### OBSERVATION AND RESULT

The Data was analyzed using SPSS 19.0.

In the present study, all data collected were statistically analyzed using SPSS 19.0. Software. The data was presented using descriptive statistics such as mean, standard deviation (SD) followed by multiple bar charts. Further comparison between AHI>10 and AHI≤10 groups was done using independent sample t-test. The recorded values were expressed as Mean±SD. The level of significance was set at 5%. All p-values less than 0.05 were considered to be significant.

**TABLE 1:- Comparison of AHI, age, BMI, waist circumference waist/hip ratio,**

Variable	Group	Mean	SD	P-value
AHI	AHI>10	44.82	31.22	0.000003
	AHI≤10	2.29	3.06	
AGE(year)	AHI>10	49.50	10.32	0.21
	AHI≤10	44.05	16.00	
BMI	AHI>10	32.45	5.97	0.00008
	AHI≤10	25.57	3.78	
Waist Circumference (cm)	AHI>10	110.27	15.25	0.00071
	AHI≤10	95.11	11.02	
Neck Circumference (cm)	AHI>10	41.97	2.80	0.0000091
	AHI≤10	36.95	3.32	
Waist/Hip Ratio	AHI>10	1.02	0.06	0.00146
	AHI≤10	0.94	0.09	
SBP (mmHg)	AHI>10	133.09	13.02	0.0063
	AHI≤10	120.89	13.82	
DBP (mmHg)	AHI>10	82.18	7.70	0.00188
	AHI≤10	78.63	4.57	

SBP and DBP among participants of AHI>10 and AHI≤10 groups.



#### RESULT:

- In AHI>10 and AHI≤10 groups the mean (mean ± SD) AHI was (44.82±31.22) and (2.29±3.06) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) age was (49.50±10.32) and (44.05±16.00) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) BMI was (32.45±5.97) and (25.57±3.78) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) waist circumference in cm was (110.27±15.25) and (95.11±11.02) respectively.
- AHI>10 and AHI≤10 groups the mean (mean ± SD) neck circumference in cm was (41.97±2.80) and (36.95±3.32) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) WAIST/HIP ratio was (1.02±0.06) and (0.94.7±0.09) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) SBP in mmHg was (133.09±13.02) and (120.89±13.82) respectively.
- In AHI>10 and AHI≤10 groups the mean (mean ± SD) DBP in mmHg was (82.18±7.70) and (78.63±4.57) respectively.

#### DISCUSSION:

This study has been done to find the relation between anthropometric parameters and sleep apnea and their effect on systemic blood pressure.

There was no significant difference in mean age among the participant of both the groups.

There was significant difference in mean AHI among participants of both the groups.

Mean BMI of participants in AHI>10 group was more as compare to mean BMI of participants in AHI≤10 group and the difference was highly significant.

Two studies by Young T showed that an increasing BMI (in increments of 5.3 or 5.6 kg per m<sup>2</sup>) was associated with an increased risk of OSA.<sup>[8,9]</sup>

Bixler EO noted that BMI greater than or equal to 31.1 kg per m<sup>2</sup> in men and 32.3 kg per m<sup>2</sup> in women was found to be predictive of OSA (OR = 7.8 and 12.8, respectively).<sup>[14,15]</sup>

Of the 1,035 patients screened by Rogers A in the MetSO cohort, 48.9% were at high risk for OSA. Using multivariate-adjusted logistic regression analysis, it was observed that obesity was the strongest predictor of OSA risk.<sup>[18]</sup>

Two studies by Martinez-Rivera C and Ibrahim AS, determined that a BMI greater than 30 kg per m<sup>2</sup> was not an independent variable for OSA,<sup>[7,10]</sup>

Mean waist circumference of participants in AHI>10 group was more as compare to mean waist circumference of participants in AHI≤10 group and the difference was highly significant.

Mean neck circumference of participants in AHI>10 group was more as compare to mean neck circumference of participants in AHI≤10 group and the difference was highly significant.

Young T, Martinez-Rivera C, noted that increase in neck circumference or percentage of predicted neck circumference (based on height) was associated with OSA (OR = 1.23 to 5.0).<sup>[8,9,11]</sup>

Two studies by Martinez-Rivera C, Ibrahim AS found no statistically significant association between OSA and a predetermined neck circumference greater than 43 cm for men and greater than 47 cm for women.<sup>[7,10]</sup>

Five studies by. Sharma SK, Young T, Young T, Ibrahim AS, Martinez-Rivera C, examined the link between neck circumference and OSA, although each study used a different clinical indicator and results were conflicting. 7-11

Mean Waist/Hip Ratio of participants in AHI>10 group was more as compare to mean Waist/Hip Ratio of participants in AHI≤10 group and the difference was highly significant.

Sharma SK, Young T, Martinez-Rivera noted that there is a link between a larger waist to-hip ratio and OSA.<sup>[7,9,11]</sup>

Mean SBP of participants in AHI>10 group was more as compare to mean SBP of participants in AHI≤10 group and the difference was highly significant.

Mean DBP of participants in AHI>10 group was more as compare to mean DBP of participants in AHI≤10 group and the difference was highly significant.

Zamzil Amin Asha'ari noted that sleep apnea associated with hypertension in young adults aged 18 to 40 years. The association was more pronounced with the increasing severity of sleep apnea. Screening for sleep apnea should be considered in young adults with hypertension.<sup>[17]</sup>

Shamsuzzaman AS noted that OSA is widely prevalent in patients with obesity, diabetes, and hypertension.<sup>[19]</sup>

JC Seidell noted that Obesity is also a risk factor for sleep apnoea where neck circumference seems to give the strongest association, and waist-hip ratio is a risk factor especially in severe obstructive sleep apnoea syndrome.<sup>[20]</sup>

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